

# How Attractive (Magnetic) is Your Litter?

**Target Level:**  
Grade 2

**SOLs:**

*Science:* 2.1, 2.2

*Math:* 2.2, 2.4

**Materials needed:**

**Part 1 -**

Several (10-15 ) classroom use magnets.

A collection of common litter items, including ones that are magnetic.

(Suggestions for magnetic items include: both metal and plastic-coated paper clips, a variety of drink container tops or lids, pens with metal clips, screws, push pins, a clean vegetable can, etc.)

**Part 2 -**

See section for additional materials

**Time Needed:**

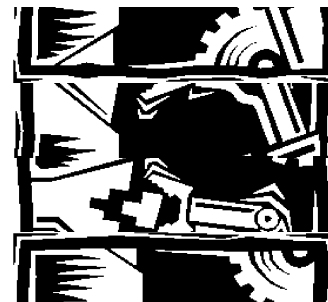
Two class periods to conduct both parts of this activity.

## Summary

Students will investigate various types of litter and invent ways to 'pick it up' as they design and construct simple machine to collect specimens.

## Objectives

Students will understand that litter is made of different materials and be able to identify whether the material is magnetic or non-magnetic. They will be able to explain characteristics of a physically constructed model and make judgements about design effectiveness. Students will also be able to analyze the data collected and come to the conclusion that prevention is easier than clean up.



## Background

Some types of metals, like gold, silver, brass and copper are so valuable you would never dream of throwing them away. But other metals-- aluminum and steel -- are often thrown away instead of reused or recycled. Steel is the most recycled material in America. Steel is made from iron ore which is magnetic. Steel cans are magnetic so magnetic belts can be used to separate cans from other garbage. This method is much more efficient than the labor-intensive hand-sorting necessary with other recyclables. Some communities team up with other localities and send there garbage to a materials recycling facility for processing. These plants, MRFs, sort the trash into glass, metal, and other recyclable products. Magnets, sieves, and blowers are used to help separate the trash into separate recycling categories. Steel can be recycled again and again, saving energy and natural resources each time.

## Preparation

Copy the "Pick Up Litter" poem/song onto a large sheet of paper or posterboard. Review the concepts of magnets with your students (If you are a guest speaker, confirm that magnets and magnetic qualities have been introduced-- Science 2.2).

## Procedure-- Part 1

1. Ask students for examples of litter. Define litter through discussion and examples (i.e. What makes the student's example "litter"?). Bring into the discussion any of the different kinds of litter that you brought, being sure to include those that are magnetic. Guide students toward reaching the conclusion that litter is made of different kinds of materials. Explain that you are going to help them get ready to design a model or a simple machine that will be able to pick up various kinds of litter (if Part 2 is going to be conducted on a different day).
2. Ask students if they know what an "inventor" does and establish a working definition. Tell students they should imagine (pretend) they are inventors of a machine that will pick up litter. What might the machine need? Have students suggest components that might be helpful (e.g.: claws, pinchers, teeth, scoops, hooks, etc.). It may be beneficial to have students relate to other machines, tools, or animals, and how they grasp or transport items.
3. Hold up a magnet and ask the students where they might have seen a magnet before (e.g., on a refrigerator). Ask the students how magnets are used and if they are useful components in machines. Have students predict what kind of litter a machine made with a magnet might pick up. Bring the students into a circle or half circle and put your pile of litter in the middle. Ask the students to predict what fraction of the litter will be magnetic. Record the information for later comparison.

4. Give every two or three students a magnet and let them go as groups to prove which items are magnetic and which are not. Discuss their findings in terms of magnetic and non-magnetic. Some items stick and some do not. What is the difference? What is the natural resource needed as a component of the litter to make it magnetic? Explain how magnets are used in recycling centers and MRFs (you contact your local public service authority about recycling processes in your community.)

5. Read through the words of the poem with the students. Encourage singing it as a song the second time through! The following can be sung to the tune of "Frere' Jacques". Hand motions are included for use if desired.

#### **"Pick Up Litter"**

Pick up litter,	(bend over and "pick up")
Pick up litter.	(bend over and "pick up")
Does it stick?	(clap hands)
Does it click?	(snap fingers)
We can make a difference,	(point to self)
You will know we got it.	(point away from you)
Litter's gone,	(spread hands flat)
Litter's gone.	(keep hands flat in front of you)

5. Discuss whether litter is a problem in the students' school/community. Where have they seen it? Whose job is it to pick it up? Is this an easy or fun job? Wrap up by challenging students with the task of inventing a litter "pick up" machine. Leave them with enthusiasm that they can be great inventors and will do a good job "picking up" litter!

#### **Part 2 Materials needed:**

A resource box of supplies containing magnets and other items which students can use to make a class machine or enough to have several cooperative groups.\* Suggestions include a dowel(s), an assortment of duct and scotch tapes, twine/string, scissors, cardboard boxes and an assortment of tubes, heavy paper, plastic cartons, polystyrene foam blocks, etc., plastic forks, clothes pins, toothpicks, big paper clips, straws, craft sticks, glue and or a glue gun. Two bags for trash the machine(s) has collected; one labeled "magnetic" and the other "non-magnetic." \*Note: More than one class machine might be constructed if additional adult assistance and material is available.

#### **Procedure- Part 2**

1. Each student (or pair of students) should choose an item(s) from the resource box and decide how it might fit onto the dowel, making a class machine that will pick up trash. Give students a few minutes to consider its design, purpose, and method of attachment. Some pieces may be purely decorative, and students may wish and agree to join their pieces prior to attaching them to the "class machine." Display and summarize the attributes of the machine, with the students assistance regarding intended use of the various components. *Variation:* Have each pair of students design individual models/machines that they will take turns operating.

2. Take the class on a predetermined litter tour (to neighboring classrooms, halls, cafeteria after lunch period, school office, etc.). Have students take turns picking up litter with their machine and depositing it into the appropriate bag.

3. Have students count the number of items in each of the bags and record their results on the blackboard.

**Data:**

How many items were collected?

total	_____
magnetic	_____
non-magnetic	_____

What fraction of the litter is magnetic?

Draw a simple picture graph or bar graph to illustrate the results.

#### **Wrap Up/Assessment**

1. Discuss what types of litter were found in different places, and ask students what types of modifications they might recommend for their machine.

2. Have students give examples of magnetic and non-magnetic litter that might be found if they were doing this at home, or at their parents workplace. Would much of the litter magnetic? How might some of this litter be prevented from occurring (proper disposal, buying items with less packaging, etc.)? Is there an easy way to pick up litter? Would it be easier to prevent litter than having to pick it up?